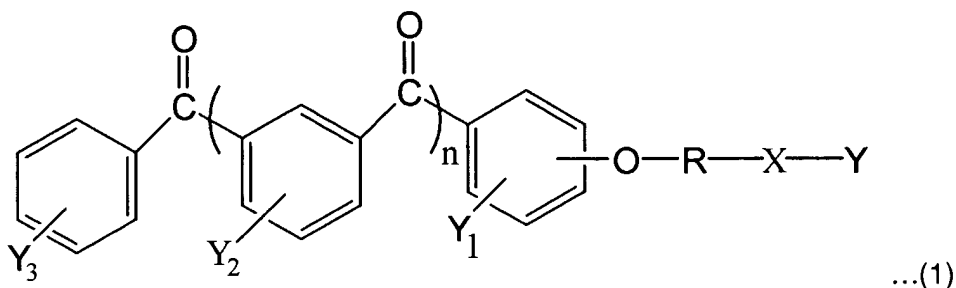


CLAIMS

What is claimed is:

1. A lightfast colorant that is a benzophenone derivative of formula (1) below:



wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;

each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

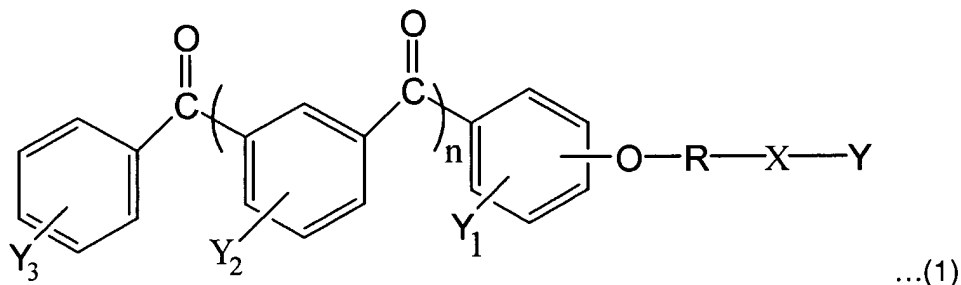
R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue.

2. The lightfast colorant of claim 1, wherein said colorant residue Y is a moiety of one of a dye and a pigment used as a colorant, the moiety excludes said linker X, and said linker X binds the colorant and the benzophenone derivative.

3. A lightfast ink composition comprising:
at least one lightfast colorant that is a benzophenone derivative of formula (1) below:



wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;
each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and

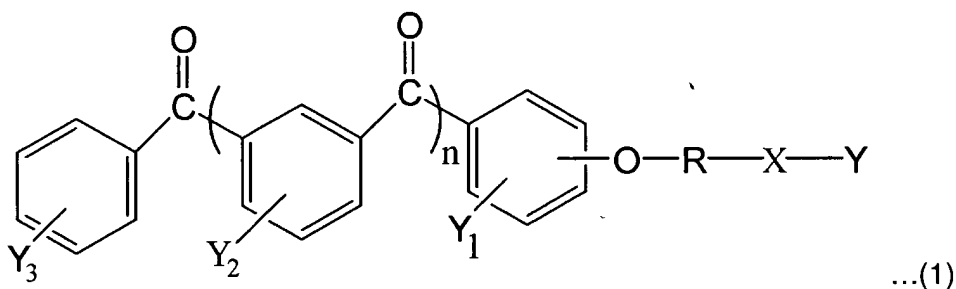
an aqueous medium.

4. The lightfast ink composition of claim 3, wherein the amount of the lightfast colorant is in the range of 0.1-20 parts by weight with respect to 100 parts by weight of the ink composition.

5. A lightfast ink composition comprising:

a colorant;

at least one lightfast colorant that is a benzophenone derivative of formula (1) below:



wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;

each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and
an aqueous medium.

6. The lightfast ink composition of claim 5, wherein the amount of the colorant is in the range of 1-25 parts by weight, the amount of the lightfast colorant is in the range of 0.1-20 parts by weight, and the total amount of the colorant and the lightfast colorant is in the range of 1.1-45 parts by weight, with respect to 100 parts by weight of the lightfast ink composition.

7. The lightfast ink composition of claim 3, wherein the aqueous medium is one of water and a mixture of 5-10% by weight of an organic solvent and 50-95% by weight of water.

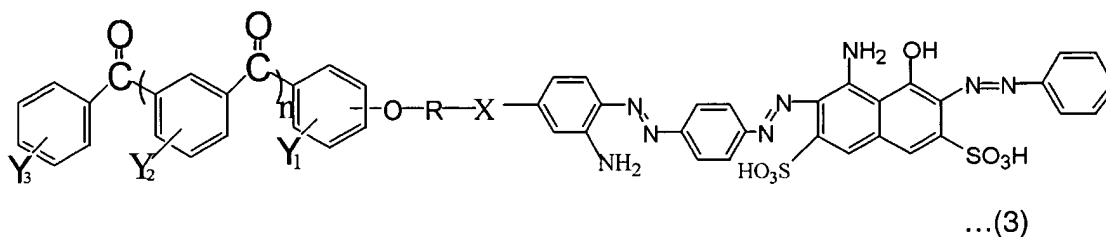
8. The lightfast ink composition of claim 7, wherein the organic solvent is selected from the group consisting of methyl alcohol, ethyl alcohol, n-propyl alcohol, isopropyl alcohol, n-butyl alcohol, sec-butyl alcohol, t-butyl alcohol, isobutyl alcohol, acetone, methylethyl ketone, diacetone alcohol, methyl acetate, ethyl acetate, ethyl lactate, ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, butylene glycol, 1,4-butane diol, 1,2,4-butane triol, 1,5-pentanediol, 1,2,6-hexane triol, hexylene glycol, glycerol, glycerol ethoxylate, trimethylolpropane ethoxylate, ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, diethylene glycol methyl ether, diethylene glycol ethyl ether, triethylene glycol monomethyl ether, triethylene glycol monoethyl ether, 2-pyrrolidone, N-methyl-2-pyrrolidone, dimethyl sulfoxide, tetramethylene sulfone, and thioglycol.

9. The lightfast ink composition of claim 3, further comprising at least one additive selected from the group consisting of a dispersant, a viscosity adjuster, a surfactant, a storage stabilizer, and a wetting agent, wherein the amount of the at least one additive is in a range of 0.5-40 parts by weight with respect to 100 parts by weight of the lightfast ink composition.

10. The lightfast ink composition of claim 5, wherein the aqueous medium is one of water and a mixture of 5-10% by weight of an organic solvent and 50-95% by weight of water.

11. The lightfast ink composition of claim 5, further comprising at least one additive selected from the group consisting of a dispersant, a viscosity adjuster, a surfactant, a storage stabilizer, and a wetting agent, wherein the amount of the at least one additive is in a range of 0.5-40 parts by weight with respect to 100 parts by weight of the lightfast ink composition.

12. The lightfast ink composition of claim 3, comprising:
at least one lightfast colorant of formula (3) below:



wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;

each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

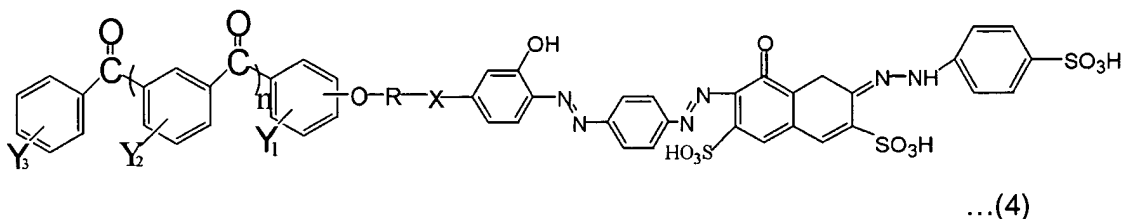
R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and

an aqueous medium.

13. The lightfast ink composition of claim 3, comprising:
at least one lightfast colorant of formula (4) below:



wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;
each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

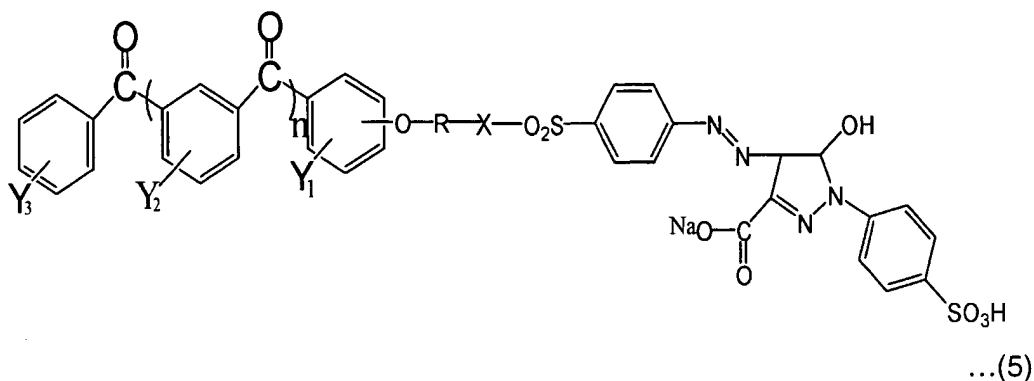
n is an integer from 0 to 6;

R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and
an aqueous medium.

14. The lightfast ink composition of claim 3, comprising:
at least one lightfast colorant of formula (5) below:



wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;

each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

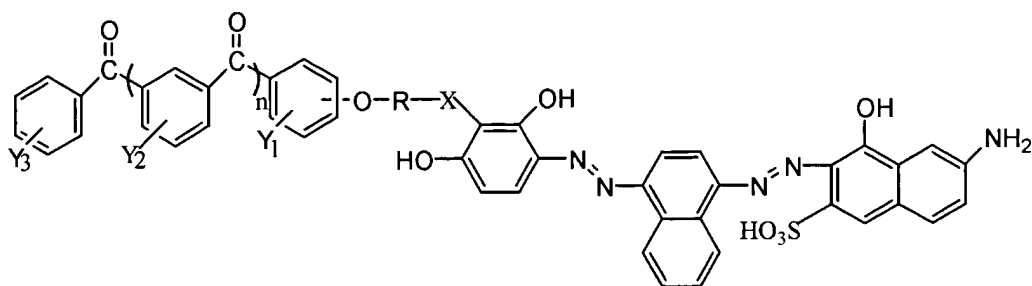
X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and

an aqueous medium.

15. The lightfast ink composition of claim 3, comprising:

at least one lightfast colorant of formula (6) below:



...(6)

wherein Y₁ is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;

each of Y₂ and Y₃ is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

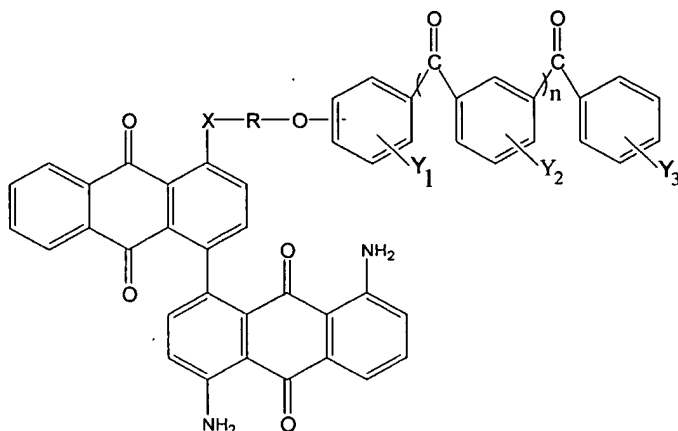
R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and

an aqueous medium.

16. The lightfast ink composition of claim 3, comprising:
at least one lightfast colorant of formula (7) below:



...(7)

wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;

each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

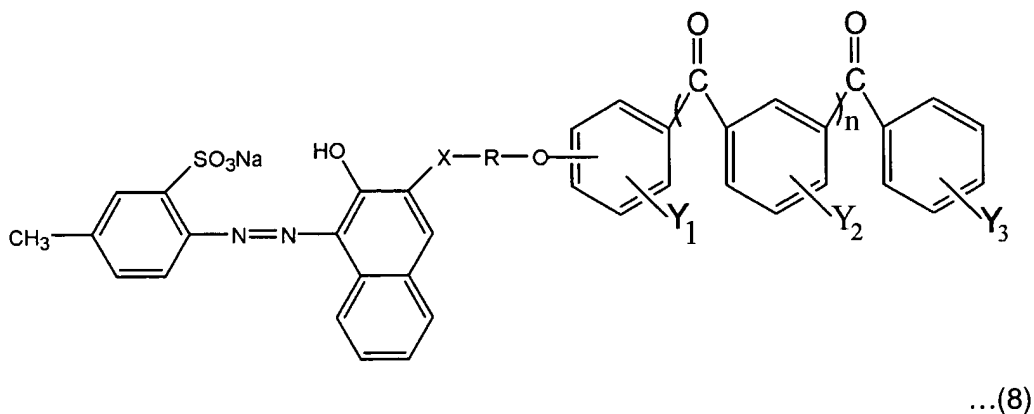
R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and
an aqueous medium.

17. The lightfast ink composition of claim 3, comprising:

at least one lightfast colorant of formula (8) below:



wherein Y_1 is one selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, -SH, and a C₁-C₃₀ heteroalkyl group, where R₁ is a C₁-C₆ alkyl group;

each of Y_2 and Y_3 is independently selected from the group consisting of -H, -OH, -NH₂, -NHR₁, -N(R₁)₂, where R₁ is a C₁-C₆ alkyl group, -SH, a substituted or unsubstituted C₁-C₃₀ alkyl group, a substituted or unsubstituted C₁-C₃₀ alkenyl group, a substituted or unsubstituted C₁-C₃₀ alkynyl group, a substituted or unsubstituted C₁-C₃₀ heteroalkyl group, a substituted or unsubstituted C₆-C₃₀ aryl group, a substituted or unsubstituted C₇-C₃₀ arylalkyl group, a substituted or unsubstituted C₃-C₃₀ heteroaryl group, and a substituted or unsubstituted C₄-C₃₀ heteroarylalkyl group;

n is an integer from 0 to 6;

R is selected from the group consisting of a substituted or unsubstituted C₁-C₃₀ alkylene group, a substituted or unsubstituted C₁-C₃₀ alkenylene group, a substituted or unsubstituted C₁-C₃₀ alkynylene group, a substituted or unsubstituted C₁-C₃₀ heteroalkylene group, a substituted or unsubstituted C₆-C₃₀ arylene group, a substituted or unsubstituted C₇-C₃₀ arylenealkylene group, a substituted or unsubstituted C₃-C₃₀ heteroarylene group, and a substituted or unsubstituted C₄-C₃₀ heteroarylenealkylene group;

X is a linker selected from the group consisting of -CONH-, -NHCO-, -COO-, -OCO-, -CO-, -O-, -S-, -SO₂-, -SO₃-, -O-P(=O)(OH)-O-, and -O-P(OH)-O-; and

Y is a colorant residue; and

an aqueous medium.